

## ASTEROID FAMILIES

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More than 100 asteroid families are presented in Williams (1). In the illustrations the open symbols are the family members.

Several examples of cratering events are known including family numbers 150, 162, 169, and 189. These are recognizable as many small fragments adjacent to and to one side (in three dimensions) of the much larger cratered body (large open circle). 14 Irene is the parent of family number 150; it is also the source of family number 43 either by a second cratering event or the breakup of a large fragment from family 150. 20 Massalia is the source of family 162 which appears to result from two cratering events. 4 Vesta gave rise to family 169. Family 189 is one of several families originating from 8 Flora. The Galileo flyby candidate 951 Gaspra is a member of that family. The parent bodies and the measured fragments in families 150, 162, and 189 are Ss. No small fragment in the Vesta family has been classified.

Family numbers 138 (Alexandra) and 140 (Eunomia) are adjacent in proper element space. In population they are an intermediate step between the long recognized families and the more frequent less populated families. The Alexandra family has been described in Williams (2). It is structurally complex. 93% of the volume is in three large bodies with diameters of 171, 155, and 127 km which are nearly aligned in three dimensions. About half of the family members, including one large object, lie in a thin disk (not recognizable in the projection of the figure). The fragmental size distribution (excluding the big three) starts at 67 km and is steeper than the belt average. The three large objects are Cs, but a disk member is a T. It may be that the parent body was already partitioned into three large blocks and the impact broke fragments from the area of impact and the block boundaries with the faces between blocks channeling the material into the disk.

The Eunomia family (number 140) contains the largest S asteroid (272 km diameter), two large Cs, and a fragmental branch which starts at 45 km diameter including three Ss, two Ms, and other objects with S/M-like albedos. The small Ss and Ms (<1% of the total volume of the family members) seem to be ejecta from cratering events on 15 Eunomia.

Family number 164 is the fifth most populous family in the belt. All members are faint and nothing is known of the physical properties.

References: (1,2) J. G. Williams, submitted to Icarus, 1991.

#### Proper e-sin i Projections of Selected Families

